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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte EFREN M. LACAP,
SUBHASH REWACHAND NARIANI,
and CHARLES NICKEL

Appeal 2009-009909
Application 10/648,586
Technology Center 1700

Decided: May 28, 2010

Before MICHAEL P. COLAIANNI, KAREN M. HASTINGS, and
JEFFREY B. ROBERTSON, *Administrative Patent Judges*.

COLAIANNI, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellants appeal under 35 U.S.C. § 134 the final rejection of claims 1-11, 25, 26, 28, and 29. We have jurisdiction over the appeal pursuant to 35 U.S.C. § 6(b).

We AFFIRM.

Appellants' invention is directed to a method of constructing specially prepared solder films to connect chips and other circuit components to printed circuit boards or other substrates (Spec. ¶ [0001]).

Claims 1, 2, 4, 7, 25, and 28 are illustrative:

1. A method of constructing a preformed solder bar made-ready-for installing a microchip to a corresponding circuit connection, comprising:

forming a socket on a first surface of a microchip containing a wafer, such that the socket has predetermined physical dimensions complementary to those of a microchip connection pad footprint occupied by at least one contact pad area on the microchip, the socket presenting a conductive base capable of bonding to solder; and

forming a solder bar in substantially continuous contact with the conductive base to place the microchip in made-ready condition for installation prior to reflowing the solder for bonding to the circuit connection,

the solder bar presenting an elongate axis parallel to a plane of the footprint, the solder bar filling the footprint, and

the step of forming a socket including depositing an adhesion layer onto the wafer via a screen printing process.

2. The method of claim 1, wherein the wafer is a silicon wafer and the step of forming the socket further comprises

depositing under-bump-metallization (UBM) material contacting the adhesion layer to complete formation of the conductive base.

4. The method of claim 2, wherein the step of depositing the UBM material includes depositing a conductor selected from at least one of titanium, tungsten, tin, aluminum, gold, silver, and lead.

7. The method of claim 1, wherein the step of forming the solder bar comprises forming a solder bar having a planar rectilinear configuration wherein a plane of the solder bar is parallel to the socket and the elongate axis.

25. The method of claim 1, wherein forming a socket comprises forming the socket such that one of a depth and a width of the socket is at least twice the other of the depth and the width.

28. The method of claim 2, wherein depositing under-bump-metallization (UBM) material comprises sputtering the UBM material.

Appellants appeal the following rejections:

1. Claims 1-11 and 29 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Appellants' Admitted Prior Art (AAPA) (Figures 1 and 2; Spec. ¶¶ [0002]-[0010]) in view of Tan (U.S. Patent 6,372,622 B1, Apr. 16, 2002) and Nguyen (U.S. Patent 4,808,274, Feb. 28, 1989).
2. Claims 25 and 26 are rejected under 35 U.S.C. § 103(a) as being unpatentable over AAPA in view of Tan, Nguyen, and Shen (U.S. Patent 6,977,396 B2, Dec. 20, 2005).
3. Claim 28 is rejected under 35 U.S.C. § 103(a) as being unpatentable over AAPA in view of Tan, Nguyen, and Tong (U.S. 2003/0157789 A1, Aug. 21, 2003).

Appellants separately argue claims 1, 4, 5, 7, 8, 25, 26, and 28 (App. Br. 8-16).

ISSUES

Rejection (1)

Did the Examiner err in determining that AAPA in view of Tan and Nguyen would have rendered obvious the subject matter of claim 1 that includes forming solder bars with an elongate axis parallel to a plane of the footprint, the solder bar filling the footprint as required by claim 1? We decide this issue in the negative.

PRINCIPLES OF LAW

The test for obviousness is what the combined teachings of the references would have suggested to one of ordinary skill in the art. *In re Keller*, 642 F.2d 413, 425 (CCPA 1981).

FACTUAL FINDINGS (FF)

We adopt the Examiner's findings in the Answer and Final Office Action as our own, except as to those that we expressly overturn or set aside in the Analysis that follows. We add the following factual findings:

1. Tan discloses that forming solder bumps with increased solder volume to increase the standoff distance between flip chip assemblies to provide improved underfill flow between interconnected devices and thereby increase reliability (col. 2, ll. 56-67; col. 3, ll. 1-7).
2. Tan discloses that the opening 42 used to form the solder bumps may be various shapes including rectangular or circular (col. 4, ll. 25-28).
3. Appellants do not contest the Examiner's combination of AAPA and Nguyen as aptly stated by the Examiner (Ans. 14; App. Br. 8-16).

ANALYSIS

Appellants argue that Tan does not teach forming a solder bar as required by claim 1 (App. Br. 10).¹ Appellants contend that Tan teaches forming solder balls because the solder bump is made spherical after reflow (App. Br. 10). Appellants further argue that the Examiner has not shown where the microchip in a made-ready condition and the solder bar having an elongate axis parallel to a plane of the footprint features are taught by the applied art (App. Br. 11). Appellants contend that the Examiner's reliance on reference numeral 3A in AAPA Figure 2 as showing a made-ready condition is erroneous because 3A represents a solder ball (App. Br. 10-11).

The Examiner responds to each of Appellants' arguments (Ans. 9-12), which Appellants do not respond to as no reply brief has been filed. Specifically, the Examiner finds that Tan contains a broader disclosure than indicated by Appellants that includes rectangular shapes for the solder bumps (Ans. 9-10); that preformed solder ball chip package is made-ready-for installation (Ans. 11); and that the Tan's solder bar has three dimensions such that one of the axes is necessarily parallel to the elongate axis of the footprint (Ans. 11-12). Because all of these findings regarding Tan fully address Appellants' arguments and these findings remain uncontested, Appellants have not shown that the Examiner's determinations are in error.

Appellants further argue that there is no reason to modify AAPA according to Tan because Tan does not teach or suggest that a solder

¹ The Examiner provides a separate reason for finding that AAPA teaches solder bars based on a definition of "solder bar" as including solder balls (Ans. 4). Appellants contest this definition (App. Br. 8-10). However, because the Examiner provides a basis for the § 103 rejection separate from the disputed definition and based on Tan that disposes of the issues, we need not reach the arguments directed to the Examiner's solder bar definition.

rectangle provides a more reliable electrical connection than a solder ball (App. Br. 14-15). Appellants contend that Tan's disclosure that various shapes may be used to form the solder is not the same as stating that solder balls and solder rectangles are interchangeable (App. Br. 14).

Appellants' arguments are not persuasive because Tan need not provide a reason for combining its rectangular shaped solder with AAPA. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 419 (2007) ("The obviousness analysis cannot be confined by a formalistic conception of the words teaching, suggestion, and motivation, or by an overemphasis on the importance of published articles and the explicit content of issued patents"). Rather, any need or problem known in the field of endeavor at the time the invention and addressed by the patent can provide a reason for the combining the elements in the manner claimed. *KSR*, 550 U.S. at 420.

In the present case, Tan recognizes a problem with the prior art having insufficient solder volume which thereby reduces reliability of the device (col. 1, ll. 49-55). Tan teaches using larger sized solder connections, which may be rectangular, produce a more reliable device (col. 2, ll. 62-67; col. 3, ll. 1-7). Accordingly, Tan's recognition and solution to a problem with the solder volume provide a reason for modifying the shape of the AAPA solder connections to have the larger rectangular connections.

Contrary to Appellants' argument against Tan's teaching of the interchangeability of solder shapes, Tan does recognize the interchangeability of solder shapes in that Tan teaches that various solder shapes, including circular or rectangular shapes, are acceptable (col. 4, ll. 25-28). Indeed, the use of a rectangular bar shape in lieu of a solder ball shaped structure appears to be nothing more than the predictable use of a

prior art element (i.e., a larger solder shape) according to its established function (i.e., providing a better electrical connection). *KSR*, 550 U.S. at 417.

With regard to claims 4, 7, and 8, Appellants argue that the Examiner has failed to indicate where the applied prior art teaches or suggests the step of depositing UBM (under-bump-metallization) layer having the materials of claim 4, or where the subject matter of claims 7 and 8 is taught by the prior art (App. Br. 12, 13-14).

Contrary to Appellants' arguments, the Examiner finds that the UBM materials of claim 4 are taught by Tan (Ans. 12), which is not disputed by Appellants. Regarding the subject matter of claims 7 and 8, the Examiner finds that the AAPA (i.e., Figure 2, reference numeral 20A) teaches the claimed subject matter (Ans. 5), which Appellants do not dispute. Accordingly, the Examiner has not erred.

Regarding claim 5, Appellants argue that the Examiner's addition of a U-shape to Figure 2 of the AAPA does not show that Figure 2 discloses any sort of U-shape because the drawn U does not account for the UBM layer 27 and adhesion layer 25 (App. Br. 12-13). However, the Examiner finds that the complementary interfacing regions depicted by the drawn U form a U-shape within the broadest meaning of the term. We agree with the Examiner.

Appellants' arguments that the UBM layer 27 and adhesion layer 25 shows that the Examiner's drawn U-shape is inaccurate are without merit. Even if the Examiner's drawn U takes into account UBM layer 27 and adhesion layer 25, the shape would generally depict a U-shape within the broadest meaning of that term as the Examiner finds (Ans. 12-13).

Accordingly, we affirm the Examiner's § 103 rejection of claims 1-11 and 29 over AAPA in view of Tan and Nguyen.

REJECTION (2)

With regard to claims 25 and 26, Appellants argue that the Examiner failed to indicate where the features of claims 25 and 26 are disclosed in the prior art (App. Br. 15).

Contrary to these arguments, the Examiner finds that Shen suggests the claimed dimensional relationships (Ans. 14). Appellants do not dispute these findings with a reply brief. Accordingly, the Examiner did not err in finding that Shen teaches the features of claims 25-26 and that the claimed subject matter as whole would have been obvious over the combination of AAPA in view of Tan, Nguyen and Shen.

We affirm the § 103 rejection of claims 25 and 26 over AAPA in view of Tan, Nguyen and Shen.

REJECTION (3)

With regard to claim 28, Appellants argue that the Examiner's reason for modifying AAPA in view of Tan and Nguyen to use Tong's sputtering method of forming the UBM layer is conclusory and not based on objective evidence (App. Br. 16). Appellants complain that the Examiner citation to column 32 in Tong is unintelligible because Tong does not have 32 columns (App. Br. 16).

However, the Examiner plainly indicates that the citation to column 32 in Tong was a typographical error, which should have been a citation to paragraph 32. This finding is plainly supported by the body of rejection (3)

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which cites paragraphs 7 and 32. Appellants have not responded to this correction by the Examiner.

Regarding Appellants' argument that the Examiner's reason is conclusory, the Examiner provides evidence from the Tong disclosure that using sputtering to form UBM layers is known in the art (Ans. 15). Appellants do not dispute these findings.

Therefore, Appellants' argument is unpersuasive because the Examiner's reason for modifying the method of AAPA in view of Tan and Nguyen to form the UBM using Tong's sputtering method is based on evidence of record. The Examiner's reason is not conclusory.

We affirm the Examiner's § 103 rejection of claim 28 over AAPA in view of Tan, Nguyen and Tong.

DECISION

The Examiner's decision is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1).

ORDER

AFFIRMED

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